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July 29, 1998

**BOX: PATENT APPLICATION**  
Assistant Commissioner for Patents  
Washington, D.C. 20231

Re: Application of Seong-Wuk NA  
**POWER MANAGEMENT METHOD FOR A PERSONAL DIGITAL ASSISTANT**  
Our Reference: Q49396

Dear Sir:

Attached hereto is the application identified above including the specification, claims, executed Declaration and Power of Attorney, two (2) sheets of drawings, executed Assignment and PTO Form 1595.

The Government filing fee is calculated as follows:

Total Claims	6 - 20 =	0 x \$22 =	\$ 000.00
Independent Claims	2 - 3 =	0 x \$82 =	\$ 000.00
Base Filing Fee	(\$790.00)		\$ 790.00
Multiple Dep. Claim Fee	(\$270.00)		\$ 000.00
<b>TOTAL FILING FEE</b>			<b>\$ 790.00</b>
Recordation of Assignment Fee			\$ 40.00
<b>TOTAL U.S. GOVERNMENT FEE</b>			<b>\$ 830.00</b>

Checks for the statutory filing fee of \$ 790.00 and Assignment recordation fee of \$ 40.00 are attached. You are also directed and authorized to charge or credit any difference or overpayment to Deposit Account No. 19-4880. The Commissioner is hereby authorized to charge any fees under 37 C.F.R. 1.16 and 1.17 and any petitions for extension of time under 37 C.F.R. 1.136 which may be required during the entire pendency of the application to Deposit Account No. 19-4880. A duplicate copy of this transmittal letter is attached.

Priority is claimed from:

<u>Korean Patent Application</u>	<u>Filing Date</u>
1997-42735	August 29, 1997

Respectfully submitted,  
SUGHRUE, MION, ZINN, MACPEAK & SEAS  
Attorneys for Applicant(s)

By *Darryl Mexic* 24861  
Darryl Mexic  
Registration No. 23,068

DM:tnj

**POWER MANAGEMENT METHOD  
FOR A PERSONAL DIGITAL ASSISTANT**

**BACKGROUND OF THE INVENTION**

**Field of the Invention**

5           The present invention relates to a personal digital assistant, and in particular, to a power management method for a personal digital assistant which can be connected to an external communication terminal.

**Description of the Related Art**

10           A personal digital assistant (hereinafter referred to as PDA) is a multimedia device which allows one to access desired information in a desired form anytime and anywhere. The PDA has various utilities according to the user. For instance, the PDA has a personal information management  
15           (PIM) function for managing an address book, a telephone directory, a personal scheduler and memorandum. The PDA also has an additional function for gathering and exchanging information by way of facsimile or personal computer (PC) communications. Recently, the PDA may also be  
20           connected with an external communication terminal, such as a portable radio telephone. If necessary, the PDA and portable radio telephone may be unified into one body.

          When the external communication terminal and the PDA are unified, the PDA may become overloaded due to lack of  
25           power supply voltage. Therefore, there has been a demand for a PDA capable of preventing the overload, even in the case where the external communication terminal is connected to the PDA.

**SUMMARY OF THE INVENTION**

30           It is therefore an object of the present invention to provide a power management method for preventing overload of a personal digital assistant which is connectable with an external communication terminal.

To achieve the above object, there is provided a power management method for a PDA (personal digital assistant) which can be connected to an external communication terminal. Upon detecting power-on of the external communication terminal, the PDA detects a battery voltage of the PDA and compares the battery voltage with a reference voltage which is slightly higher than an inoperable voltage threshold of the PDA. If the battery voltage is lower than the reference voltage, the PDA generates a low-voltage alarm message. Otherwise, if the battery voltage is higher than the reference voltage, the PDA makes a second voltage comparison between a) the difference between the battery voltage and the power required for the external communication terminal and b) the inoperable voltage threshold of the PDA. If the difference indicated in a) is larger than the voltage of b), the PDA supplies electric power to the external communication terminal.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

The above objects and other advantages of the present invention will become more apparent by describing the preferred embodiment of the present invention with reference to the attached drawings, in which:

FIG. 1 is a schematic block diagram of a personal digital assistant (PDA) which can be connected to an external communication terminal;

FIG. 2 is a flowchart for managing power of the PDA shown in FIG. 1 according to a preferred embodiment of the present invention.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

A preferred embodiment of the present invention will be described in detail hereinbelow with reference to the accompanying drawings. To provide a comprehensive description of the present invention, the present invention will be illustratively described, confined to the specific

embodiment, but the invention is not limited thereto. Furthermore, it should be noted that the present invention can be implemented by anyone skilled in the art with the following general description. In the description, well-known functions or constructions are not described in detail to avoid obscuring the invention.

Referring to FIG. 1, a PDA 114 includes a central processing unit (CPU) 100 for controlling an overall operation of the PDA 114 according to a control program stored in a ROM (Read Only Memory) 104. The ROM 104 stores the control program of the CPU 100, data representative of a voltage drop according to the power consumption of an external communication terminal connected to the PDA 114, and various reference data (e.g., data indicative of an inoperable voltage  $V_i$  of the PDA). A RAM (Random Access Memory) 106 temporarily stores data generated in the process of executing the control program by the CPU 100. A keypad 108 includes a plurality of numeric and function keys for generating key data to the CPU according to a key operation supplied by the user. A display 110 displays the operational status of the PDA 114 under the control of the CPU 100. A connector 112 consists of a serial port to connect the PDA 114 to the external communication terminal, and interfaces various data and control signals with the external communication terminal under the control of the CPU 100. A battery level detector 102 detects a voltage level of a battery (not shown) of the PDA 114 under the control of the CPU 100.

FIG. 2 shows a flowchart for managing the power of the PDA 114. Generally, the CPU 100 detects a voltage difference between a battery voltage  $V_c$  and a voltage drop  $V_e$  according to the power consumption of the external communication terminal. The CPU cuts off the electric power to the external communication terminal if the voltage difference is lower than the inoperable voltage threshold  $V_i$  of the PDA 114. The control flow of FIG. 2 is programmed into the ROM 104 and executed by the CPU 100.

Now, referring to FIGS. 1 and 2, if the user turns on the external communication terminal connected to the PDA 114 at step 200, the CPU 100 of the PDA 114 proceeds to step 202 to detect the battery voltage  $V_c$  by virtue of the battery level detector 102. The CPU 100 checks, at step 204, whether the battery voltage  $V_c$  is higher than a first reference voltage  $V_o$  indicative of an alarm generation voltage. The alarm generation voltage  $V_o$  is a voltage slightly higher than a threshold voltage at which the PDA 114 cannot operate normally. The alarm generation voltage  $V_o$  can be properly set according to various operating conditions of the PDA 114. If the battery voltage  $V_c$  is lower than the alarm generation voltage  $V_o$ , the CPU 100 proceeds to step 218 to generate a low-voltage alarm message through the display 110 or a speaker (not shown) and to cut off electric power to the external terminal. Thereafter, the CPU 100 checks, at step 220, whether the battery voltage  $V_c$  is lower than the inoperable voltage  $V_i$  at which the PDA 114 cannot operate normally. If the battery voltage  $V_c$  of the PDA 114 is higher than the inoperable voltage  $V_i$ , the CPU 100 ends this process. However, if the battery voltage  $V_c$  of the PDA 114 is lower than the inoperable voltage  $V_i$ , the CPU 100 sets the PDA 114 to a sleep mode in step 222. In the sleep mode, every part of the PDA 114 is inactive other than particular functions of the CPU 100, such as a power-on/off function.

However, if the battery voltage  $V_c$  is higher than the alarm generation voltage  $V_o$  at step 204, the CPU 100 proceeds to step 206 to read, from the ROM 104, a voltage drop  $V_e$  corresponding to the power consumption, or voltage drop, of the external communication terminal. The ROM 104 previously stores data corresponding to the voltage drops  $V_e$  of respective external communication terminals to be connected to the PDA 114. The CPU 100 checks, at step 208, whether a voltage difference ( $V_c - V_e$ ) between the battery voltage  $V_c$  and the voltage drop  $V_e$  is higher than the inoperable voltage threshold  $V_i$  of the PDA. If the voltage

difference is lower than the inoperable voltage  $V_i$ , the CPU 100 proceeds to step 212 to generate an alarm message informing the user that it is impossible to power on the external communication terminal connected to the PDA 114. Subsequently, the CPU 100 checks, at step 214, whether the external communication terminal is powered off. If it is not powered off, the CPU 100 returns to step 212 to repeat the steps 212 and 214 until the user powers off the external communication terminal. If the external communication terminal is powered off at the step 214, the CPU 100 cuts off the electric power to the external communication terminal at step 216. However, if the voltage difference ( $V_c - V_e$ ) is higher than the inoperable voltage  $V_i$ , the CPU 100 proceeds to step 210 to supply electric power to the external communication terminal and then, returns to step 202. In this way, the PDA according to the present invention can prevent the overload of the battery.

Although an illustrative embodiment of the present invention has been described herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to the precise embodiment so disclosed. Various other changes and modifications may be effected by one skilled in the art without departing from the scope or spirit of the invention.

**WHAT IS CLAIMED IS:**

1. A power management method for a personal digital assistant which can be connected with an external communication terminal, comprising the steps of:

upon detecting power-on of said external communication terminal, detecting a battery voltage of said personal digital assistant;

comparing said battery voltage with a reference voltage, said reference voltage being slightly higher than an inoperable voltage of said personal digital assistant;

generating a low-voltage alarm message when said battery voltage is lower than said reference voltage; and

supplying electric power to said external communication terminal, if said battery voltage is higher than said reference voltage.

2. The method as claimed in claim 1, further comprising the steps of:

comparing said battery voltage with an inoperable voltage threshold of said personal digital assistant; and

setting the personal digital assistant to a sleep mode when said battery voltage is lower than said inoperable voltage threshold of said personal digital assistant.

3. The method as claimed in claim 1, further comprising the steps of:

calculating a difference voltage between said battery voltage and a voltage drop according to a power consumption of said external communication terminal;

comparing said difference voltage with an inoperable voltage threshold at which said personal digital assistant cannot operate normally;

repeatedly generating an alarm message informing a user that the battery voltage is insufficient to normally activate said external communication terminal when said difference voltage is lower than said inoperable voltage

threshold, until said external communication terminal is turned off; and

15        providing electric power to said external communication terminal when said difference voltage is higher than said inoperable voltage threshold.

4.    The method as claimed in claim 3, wherein said alarm message is generated through at least one of a display and a speaker.

5.    A power management method for a personal digital assistant which can be connected with an external communication terminal, comprising the steps of:

5        upon detecting power-on of said external communication terminal, detecting a battery voltage of said personal digital assistant;

      comparing said battery voltage with a reference voltage, said reference voltage being slightly higher than an inoperable voltage of said personal digital assistant;

10       generating a low-voltage alarm message when said battery voltage is lower than said reference voltage; and

      comparing said battery voltage with an inoperable voltage threshold of said personal digital assistant when said battery voltage is lower than said reference voltage; and  
15

      setting the personal digital assistant to a sleep mode when said battery voltage is lower than said inoperable voltage threshold of said personal digital assistant;

20       supplying electric power to said external communication terminal when said battery voltage is higher than said reference voltage.

6.    The method as claimed in claim 5, further comprising the steps of:

      calculating a difference voltage between said battery voltage and a voltage drop according to a power consumption



5 of said external communication terminal when said battery voltage is higher than said reference voltage;

comparing said difference voltage with said inoperable voltage threshold at which said personal digital assistant cannot operate normally;

10 repeatedly generating an alarm message informing a user that the battery voltage is insufficient to normally activate said external communication terminal when said difference voltage is lower than said inoperable voltage threshold, until said external communication terminal is  
15 turned off; and

providing electric power to said external communication terminal when said difference voltage is higher than said inoperable voltage threshold.

# **ABSTRACT OF THE DISCLOSURE**

A power management method for a PDA (personal digital assistant) which can be connected with an external communication terminal is described. Upon detecting power-on of the external communication terminal, the PDA detects a battery voltage of the PDA and compares the battery voltage with a reference voltage which is slightly higher than an inoperable voltage of the PDA. If the battery voltage is lower than the reference voltage, the PDA generates a low-voltage alarm message. Otherwise, if the battery voltage is higher than the reference voltage, the PDA supplies electric power to the external communication terminal.

0944052-072998

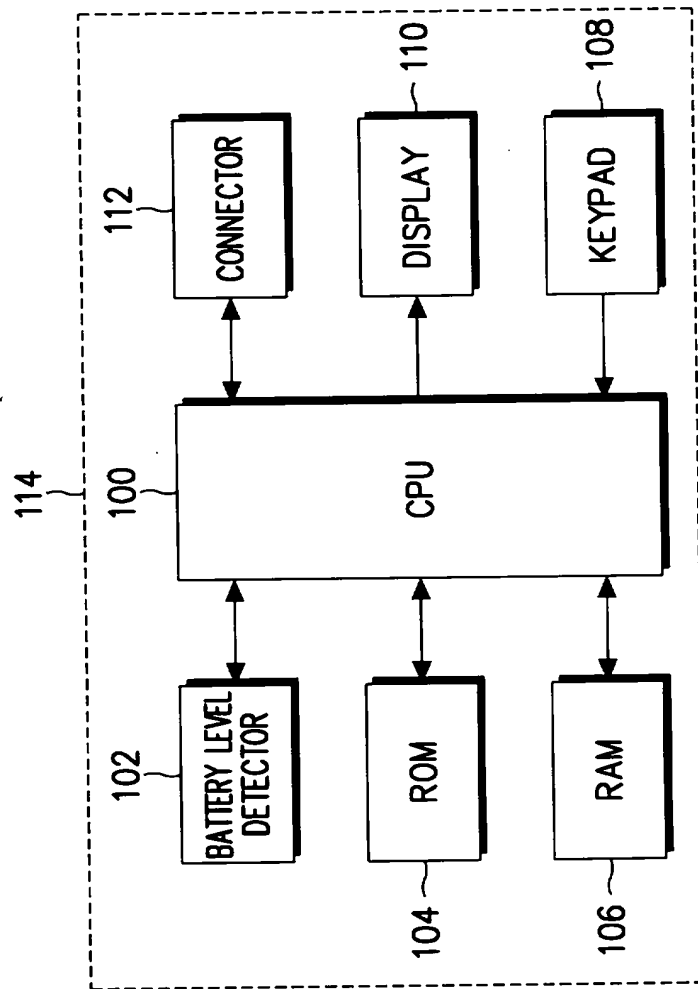


FIG. 1

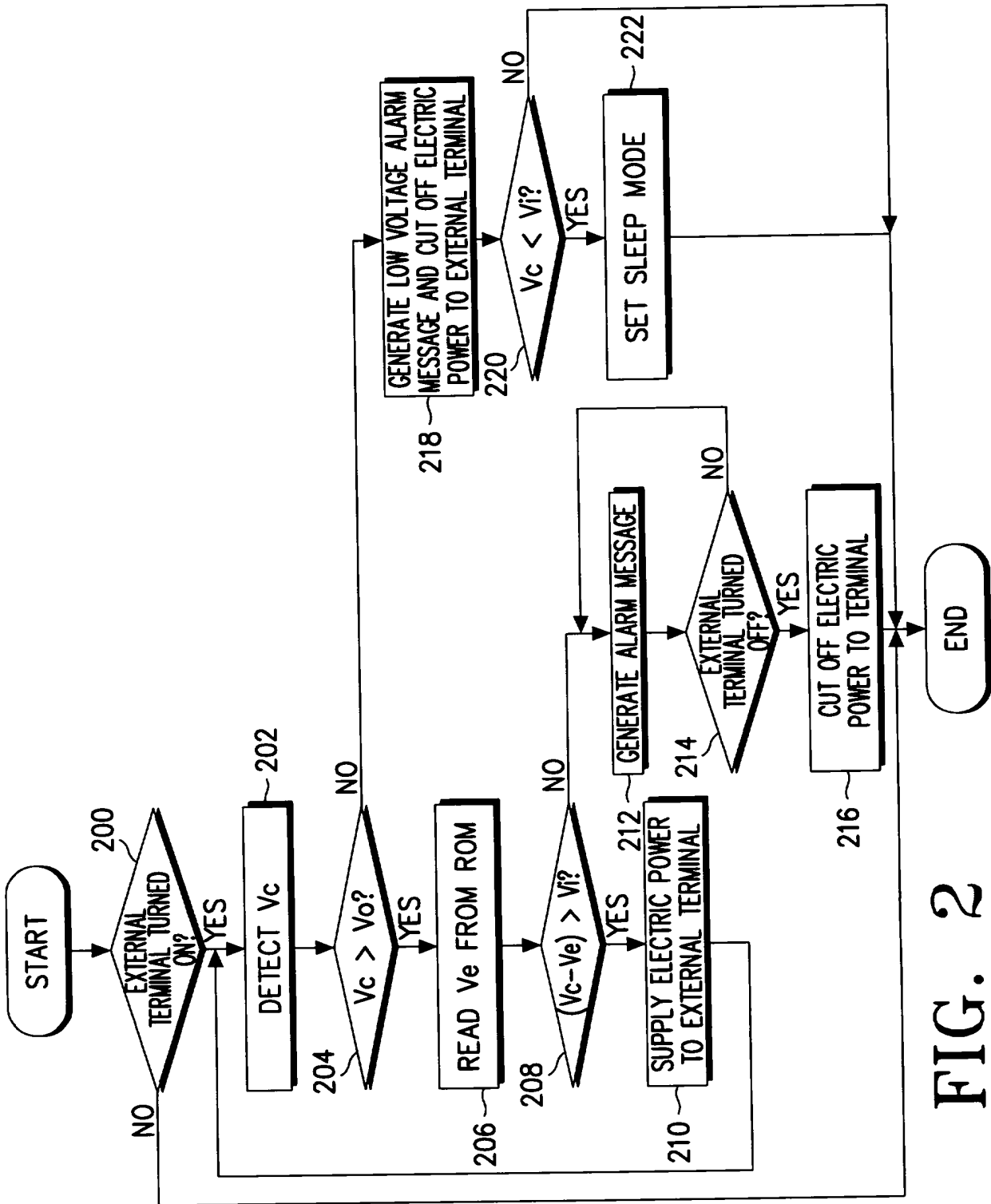


FIG. 2

# Declaration and Power of Attorney For Patent Application

출원서원본상의 선서서와 위임장

Korean Language Declaration

한국어 선서서

하기한 발명자인 본인은 다음과 같이 선서합니다:

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본인은 아래에 기재된 발명에 대한 최초의 단독발명자  
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공동발명자 (복수의 발명자가 아래에 기재되었을 경우)  
라고 믿습니다.

\_\_\_\_\_  
\_\_\_\_\_

아래 박스에 표시가 되어있지 않는 한  
특허설명서는 여기에 첨부되어 있음:

☐ \_\_\_\_월 \_\_\_\_일 미국출원번호 또는 PCT국제출원번호  
\_\_\_\_로 출원되었으며  
\_\_\_\_월 \_\_\_\_일 수정되었습니다.  
(만약 적용가능하면)

본인은 상기 수정출원을 포함하여 특허설명서 내용을  
검토하였으며 잘 파악하고 있음을 선서합니다.

본인은 연방규정집전 37장 1.56편에 따라 특허자격에  
있어 중요한 정보자료를 밝히는 것이 본인의 의무임을  
인정합니다.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as  
stated next to my name.

I believe I am the original, first and sole inventor (if only  
one name is listed below) or an original, first and joint  
inventor (if plural names are listed below) of the subject  
matter which is claimed and for which a patent is sought  
on the invention entitled

POWER MANAGEMENT METHOD FOR A

PERSONAL DIGITAL ASSISTANT

the specification of which is attached hereto unless the  
following box is checked:

☐ was filed on \_\_\_\_\_  
as United States Application Number or  
PCT International Application Number  
\_\_\_\_\_ and was amended on  
\_\_\_\_\_ (if Applicable).

I hereby state that I have reviewed and understand the  
contents of the above identified specification, including the  
claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is  
material to patentability as defined in the Title 37, Code of  
Federal Regulations, Section 1.56.

# Korean Language Declaration

## 한국어 선서서

본인은 미합중국법전 35장 119(a)-(d)편 또는 특허 또는 발명자 증서를 위한 그 어떤 외국출원의 365(b)편 또는 미국 이외에 최소한 한 국가를 지정하는 PCT국제출원의 365(a)편하의 외국우선권을 주장합니다. 아래 박스에 표시함으로써 기재하고 확인합니다.

### Prior Foreign Application(s)

이전의 외국 출원

1997-42735 Korea  
(Number) (번호) (Country) (국명)

(Number) (번호) (Country) (국명)

(Number) (번호) (Country) (국명)

I hereby claim foreign priority under Title 35, United States Code, Section 113 (a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application having a filing date before that of the application on which priority is claimed.

Priority Not Claimed  
우선권 주장안함

29/08/1997  
(Day/Month/Year Filed) (출원년월일)

(Day/Month/Year Filed) (출원년월일)

(Day/Month/Year Filed) (출원년월일)

본인은 미합중국법전 35장, 아래에 기재한 그 어떤 미국가출원의 119(a)편하의 권한을 주장합니다.

I hereby claim the benefit under Title 35, United States Code, Section 119(a) of any United States provisional application(s) listed below.

(Application No.) (출원번호) (Filing Date) (출원일)

(Application No.) (출원번호) (Filing Date) (출원일)

본인은 미합중국법전 35장, 그 어떤 미국출원의 120(a) 편 또는 미국을 지정하는 그 어떤 PCT국제출원의 365(c)편하의 권한을 주장합니다. 미합중국법전 35장 112편의 첫단락에 제시된 방법에 따라 이전의 미국 또는 PCT국제출원에 이제까지 기재된 본출원 내용은 밝혀지지 않았습니다. 본인은 연방규정법전 37장 1.56편에 따라 이전출원의 출원일과 국내 또는 PCT국제출원의 출원일 사이에 유효한 특허자격에 있어 중요한 정보자료를 밝히는 것이 본인의 의무임을 인정합니다.

I hereby claim the benefit under Title 35, United States Code, Section 120(a) of any United States application(s), or 365(c) of any PCT international application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code Section 112. I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of application.

(Application No.) (출원번호) (Filing Date) (출원일)

(Status: Patented, Pending, Abandoned) (현황: 특허완료, 심사중, 포기됨)

(Application No.) (출원번호) (Filing Date) (출원일)

(Status: Patented, Pending, Abandoned) (현황: 특허완료, 심사중, 포기됨)

본인이 아는 바에 의하면 여기에 작성된 모든 기재사항 등과 정보자료로 제출한 모든 기재사항들은 진실된 것임을 선서하며, 그리고 이러한 진술이 고의적인 허위진술이거나 이와 비슷한 경우에는 미합중국법전 18장 1001 편에 따라 벌금이나 징역형 또는 그 병과형으로 처벌되며, 허위진술은 본출원의 유효성이나 발급된 특허증을 위태롭게 할 수도 있다는 점을 선서합니다.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

# Korean Language Declaration

## 한국어 선서서

위원장: 본인은 본건출원과 관련된 모든 사무를 처리하기 위하여 대리인을 지명합니다. 상기 각자는 대리인으로서 및 업무제휴가 되어있는 대리인을 지명할 전권을 갖습니다. (성명 및 등록번호 기재)

**POWER OF ATTORNEY:** As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith (list name and registration number)

I hereby appoint John H. Mion, Reg. No. 18,879; Donald E. Zinn, Reg. No. 19,046; Thomas J. Macpeak, Reg. No. 19,292; Robert J. Seas, Jr., Reg. No. 21,092; Darryl Mexic, Reg. No. 23,063; Robert V. Sloan, Reg. No. 22,775; Peter D. Olexy, Reg. No. 24,513; J. Frank Osha, Reg. No. 24,625; Waddell A. Biggart, Reg. No. 24,861; Robert G. McMorrow, Reg. No. 19,093; Louis Gubinsky, Reg. No. 24,835; Neil B. Siegel, Reg. No. 25,200; David J. Cushing, Reg. No. 28,703; John R. Inge, Reg. No. 26,916; Joseph J. Ruch, Jr., Reg. No. 26,577; Sheldon I. Landsman, Reg. No. 25,430; Richard C. Turner, Reg. No. 29,710; Howard L. Bernstein, Reg. No. 25,665; Alan J. Kasper, Reg. No. 25,426; Kenneth J. Burchfiel, Reg. No. 31,333; Gordon Kit, Reg. No. 30,764; Susan J. Mack, Reg. No. 30,951; Frank L. Bernstein, Reg. No. 31,484; Mark Boland, Reg. No. 32,197; William H. Mandir, Reg. No. 32,158; Scott M. Daniels, Reg. No. 32,562; Brian W. Hannon, Reg. No. 32,778; Abraham J. Rosner, Reg. No. 33,276; Bruce E. Kramer, Reg. No. 33,725; Paul F. Nells, Reg. No. 33,102; and Brett S. Sylvester, Reg. No. 32,765, my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and request that all correspondence about the application be addressed to SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC, 2100 Pennsylvania Avenue, N.W., Washington, D.C. 20037-3202.

서신을 위한 주소:

Send Correspondence to:

SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC  
2100 Pennsylvania Avenue, N.W.  
Washington, D.C. 20037-3202  
(202) 293-7060

직통전화번호: (성명 및 전화번호)

Direct Telephone Calls to: (name and phone number)

단독 혹은 처음발명자의 성명	Full name of sole or first inventor
발명자의 서명	Inventor's signature
날짜	Date
거주지	Residence
국적	Citizenship
우편주소	Post Office Address
두번째 합동 발명자 성명 (만약 있으면:)	Full name of second joint inventor, if any
두번째 발명자의 서명	Second inventor's signature
날짜	Date
거주지	Residence
국적	Citizenship
우편주소	Post Office Address

(세번째와 그외 합동발명자의 위와 비슷한  
기재사항과 서명을 제공하십시오.)

(Supply similar information and signature for third and  
subsequent joint inventors.)